Decibell Consulting pty Ltd

Proposed Reconfiguration of a Lot

Aspire
16-66 Wesley Rd,
Griffin

REVISED ENVIRONMENTAL NOISE IMPACT REPORT

Prepared for

Fairmont Group

23rd January 2019
Decibell Report No. 1901251

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1.0 INTRODUCTION

This report is submitted in response to a request by Land Surveying Dynamics and Green Haven Projects, on behalf of the Fairmont Group for a revised environmental noise impact assessment of a proposed reconfiguration of a number of Lots located at 16-66 Wesley Rd, Griffin. This revised acoustic report seeks to remodel traffic and rail noise impacts on the site taking into account the actual heights of the "*as constructed*" noise barrier on site. The "*as constructed*" barrier differs slightly in height from the original proposed barrier on the site. The report is also reflective of some changes in pad levels of proposed lots on site.

On-site noise logging and attended noise measurement were conducted, and through modelling, predictions of noise impacts from the development on the neighbouring residences have been undertaken. Based upon these predicted levels, recommendations regarding acoustic treatments and management practices have been specified.

1.1 The Proposal

The proposal is to reconfigure a number of existing lots at 16-66 Wesley Rd, to form 635 new lots. It is intended that the project will be developed over a number of stages.

The proposed development will be located immediately adjacent to Bruce Highway. However no direct vehicular access to the development will be provided off the highway. Access to the development will be provided via a road to Wesley Rd which is located to the south of the development. The Bruce Highway is a large state controlled road carrying significant traffic volumes. As such it is likely to generate traffic noise levels that will impact on the proposed development. In this report the impact of traffic noise from the Bruce Highway on the proposed development will be considered.

Moreton Bay Rail Link runs along the northern edge of the proposed development. This rail line runs between Kippa Ring and Brisbane City and is part of the Brisbane City Train Network. The rail noise impacts from this line on the development will also be considered in this report.

For further details of the development layout refer to appendix for site and building plans.

2.0 EQUIPMENT

2.1 Existing Ambient Noise Assessment

The following equipment was used to record existing ambient noise levels at the site:

- Bruel & Kjaer 4231 Calibrator;
- Rion NL 21 Environmental Noise Logger.

3.0 MEASUREMENT PROCEDURE

3.1 Traffic Noise Measurement

Two noise loggers were located on site and used to conduct measurements. The first logger was positioned along the western boundary of the site adjacent to the Bruce Highway. This location was chosen as it afforded a clear view of the Bruce Highway and would best quantify traffic noise levels at the site. While the second logger was located along the northern boundary of the site adjacent to the rail reserve in order to quantify train noise. As both loggers was located clear of any building on site measurements recorded by the loggers can be regarded as free field. The locations of the loggers are marked on aerial photograph below.

Figure 1: Logger Measurement Location

Both loggers were set to record noise statistics in 15 minute blocks continually over 48 hours in consecutive periods from Tuesday 11/07/17 to Thursday 13/07/17. The statistical interval was chosen to allow application of AS/NZS 2107:2000 *'Acoustics – Recommended Design Sound Level and Reverberation Times for Building Interiors'*.

Ambient noise level measurements were conducted generally in accordance with Australian Standard AS1055 1997 "*Acoustics – Description & Measurement of Environmental Noise"*.

The operation of the sound level measuring equipment was field calibrated before and after the measurement session and was found to be within 0.1 dB of the reference signal. All instrumentation used in this assessment hold current calibration certificate from a certified NATA calibration laboratory.

Weather conditions during the survey were fine, with light winds and temperatures ranging from 11˚ C to 23˚ C over the measurement period.

4.0 NOISE CRITERIA

4.1 Road Traffic Noise

As the proposed development is adjacent to the Bruce Highway which is a state controlled road reference must be be made to the *State Development Assessment Provisions – State Code 1 –Development in a State-controlled road environment.* The *State Development Assessment Provisions – State Code 1 – Development in a State-controlled road environment* seeks to ensure:

. *".the community is protected from significant adverse impacts resulting from environmental emissions generated by vehicles using **state-controlled roads**."*

The Criteria for assessment for road noise from the *State Development Assessment Provisions – State Code 1 –Development in a State-controlled road environment* is contained in Table 1.1.1. The portion of the table relation to road noise has been reproduced below.

Performance outcomes	Acceptable outcomes
Noise	
Accommodation Activities	
PO23 Development involving an **accommodation activity** or land for a future **accommodation activity** minimizes noise intrusion from a **state-controlled road** or **type 1 multi-modal corridor** in **habitable rooms**.	**AO23.1** A noise barrier or earth mound is provided which is designed, sited and constructed: 1. to meet the following external noise criteria at all facades of the building envelope: a. ≤60 dB(A) L_{10} (18 hour) façade corrected (measured L_{90} (8 hour) free field between 10pm and 6am ≤40 dB(A)) b. ≤63 dB(A) L_{10} (18 hour) façade corrected (measured L_{90} (8 hour) free field between 10pm and 6am >40 dB(A)) 2. in accordance with chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013. **Habitable rooms** of **relevant residential buildings** located within a **transport noise corridor** must comply with the Queensland Development Code MP4.4 Buildings in a transport noise corridor, Queensland Government, 2015. **Transport noise corridors** are mapped on the State Planning Policy interactive mapping system.
PO24 Development involving an **accommodation activity** or land for a **future accommodation activity** minimizes noise intrusion from a **state-controlled road** or **type 1 multi-modal corridor** in **outdoor spaces for passive recreation**	**AO24.1** A noise barrier or earth mound is provided which is designed, sited and constructed: 1. to meet the following external noise criteria in **outdoor spaces for passive recreation**: a. ≤57 dB(A) L_{10} (18 hour) free field (measured L_{90} (18 hour) free field between 6am and 12 midnight ≤45 dB(A)) b. ≤60 dB(A) L_{10} (18 hour) free field (measured L_{90} (18 hour) free field between 6am and 12 midnight >45 dB(A)) 2. in accordance with chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise, Department of Transport and Main Roads, 2013.

Table 1.1.1: Building Work and Material Change of Use

In order to achieve the Internal Noise Criteria in *AO 1.1* the methods described *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code shall be used to determine the required acoustic treatment for the building. Using the methods set out in *MP 4.4* the applicable noise category for a particular part of the building is determined from Table 1 of Schedule 3 of *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code and relates to the measured or predicted noise level 1m from the façade of the proposed or existing building. This table has been reproduced below and details noise levels relating to the various *Noise Category Levels:*

Table 1 – Noise Category Levels

Noise Category	*Level of Transport noise *($L_{A10,18hr}$) for State-controlled roads and designated local government roads*
Category 4	≥ 73 dB(A)
Category 3	68 – 72 dB(A)
Category 2	63 – 67 dB(A)
Category 1	58 – 62 dB(A)
Category 0	≤ 57 dB(A)

* Measured at 1m from the façade of the proposed or existing building

Under the Code, once the relevant Noise Category has been determined for a particular building or level of a particular building a specific minimum Rw rating for each building component must be achieved from Schedule 1 of the code in order to meet the requirements of *Acceptable Solution A1*. Schedule 1 of the Code has been reproduced in the Appendix of this report.

4.2 Rail Traffic Noise

The proposed development is adjacent of the Redcliffe Peninsula Rail Line. The *State Development Assessment Provisions – State Code 2 –Development in a railway environment* requires that community be protected from the:

.."significant adverse impacts on health, wellbeing and quality of life resulting from environmental emissions (noise and vibration) generated by existing and future state transport operations and infrastructure."

The Criteria for assessment for railway noise from the *State Development Assessment Provisions – State Code 2 –Development in a railway environment* is contained in Table 2.2.2. The portion of the table relation to railway noise has been reproduced below:

Performance outcomes	Acceptable outcomes
Noise	
Accommodation Activities	
PO24 Development involving: **1. an accommodation activity; or** **2. land for a future accommodation activity** **minimizes noise intrusion from a railway or type 2 multi-modal corridor in habitable room**	**AO24.1 A noise barrier or earth mound is provided which is designed, sited and constructed:** **1.to meet the following external noise criteria at all facades of the building envelope:** **a. ≤65 dB(A) Leq (24 hour) façade corrected** **b. ≤87 dB(A) (single event maximum sound pressure level) façade corrected** **2. in accordance with the Civil Engineering Technical Requirement - CIVIL-SR-014 Design of noise barriers adjacent to railways, Queensland Rail, 2011.** **Habitable rooms** of **relevant residential buildings** located within a **transport noise corridor** must comply with the Queensland Development Code MP4.4 Buildings in a transport noise corridor, Queensland Government, 2015. **Transport noise corridors** are mapped on the State Planning Policy interactive mapping system.
PO25 Development involving an accommodation activity minimizes noise intrusion from a railway or type 2 multi-modal corridor in outdoor spaces for passive recreation.	**AO25.1 A noise barrier or earth mound is provided which is designed, sited and constructed:** **1. to meet the following external noise criteria in outdoor spaces for passive recreation:** **a. ≤62 dB(A) Leq (24 hour) free field** **b. ≤84 dB(A) (single event maximum sound pressure level) free field** **2. in accordance with the Civil Engineering Technical Requirement - CIVIL-SR-014 Design of noise barriers adjacent to railways, Queensland Rail, 2011.**

Table 2.2.2: Building Work and Material Change of Use

In order to achieve the Internal Noise Criteria in *AO 2.3* the methods described *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code shall be used to determine the required acoustic treatment for the building. Using the methods set out in *MP 4.4* the applicable noise category for a particular part of the building is determined from Table 1 of Schedule 3 of *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code and relates to the measured or predicted noise level 1m from the façade of the proposed or existing building. This table has been reproduced below and details noise levels relating to both rail and the appropriate *Noise Category Level:*

Table 1 – Noise Category Levels

Noise Category	*Single event maximum noise* (L_{max}) for railway land*
Category 4	≥ 85 dB(A)
Category 3	80 – 84 dB(A)
Category 2	75 – 79 dB(A)
Category 1	70 – 74 dB(A)
Category 0	≤ 69 dB(A)

* Measured at 1m from the façade of the proposed or existing building

Under the Code once the relevant Noise Category has been determined for a particular building or level of a particular building a specific minimum Rw rating for each building component must be achieved from Schedule 1 of the code in order to meet the requirements of *Acceptable Solution A1*. Schedule 1 of the Code has been reproduced in Section 6.1 Traffic noise of this report.

5.0 RESULTS & CALCULATIONS

5.1 Road Traffic Noise

5.1.1 Measured Levels Logger Survey

The table below presents measured road traffic noise levels measured over the two day period at the logger measurement location. The logger's location was away from any building that may have influenced measurements. Measurements therefore can be regarded as free field and as not including the +2.5 dB façade reflection. The $L_{10,18hr}$ noise level was measured as approximately 75 dB(A). Graphical presentation of the logger measured noise levels are presented in the appendix to this report.

Descriptor	Time Period	Measured Level dB(A)
$L_{A10,18hr}$	6:00 am to 12:00 pm	75
$L_{A90,8hr}$	10:00 pm to 6:00 am	59
$L_{A90,18hr}$	6.00 am to 12.00 pm	68

Table 2: Measured road traffic noise levels at proposed site.

5.1.2 Existing and Future Traffic Flows

The existing traffic flows for the Bruce Highway were obtained from Department of Transport and Main Roads traffic counts. Predicted traffic flows for the year 2028 are based on an annual growth rate of 1.5 % p.a.. Existing and predicted traffic volumes are presented below:

Existing Traffic Flows

Bruce Highway: 117810 vehicles per 18 hour, 9.8 % HV

Predicted Traffic Flows (Year 2028):

Bruce Highway: 138780 vehicles per 18 hour, 9.8 % HV

5.1.3 Modelled Noise Levels – Existing Situation

Road traffic noise predictions were conducted using PEN 3D 2000, a CoRTN based model produced by Ask Software Engineers, and deemed acceptable under the Environmental Protection (Noise) Policy. To verify the road traffic noise prediction model, the $L_{A10,18hr}$ traffic noise levels were calculated and compared to the measured noise levels. The following assumptions were made in the verification of the noise model:

- The road surfaces were assumed to be dense graded asphalt;
- The source line of traffic noise on both road is 0.5m above the road surface;
- The traffic speeds along the Bruce Highway are 100 km/hr as signed;

A print out of the calculations performed by the model is included in the appendix to this report. The results are compared to the measured value in the table below.

Predicted $L_{A10,18hr}$	Measured $L_{A10,18hr}$
74.9	75

Table 3: A Comparison of Predicted and Measured Traffic Noise Levels at the Logger Location

This is within the allowable 2 dB variation under the CoRTN methodology

5.1.4 Modelled Noise Levels – Year 2028

If the validity of the model is now accepted, the predicted increased traffic flows for the year 2028 can be input into the PEN 3D 2000 model to predict the ultimate traffic noise impacts. The predicted ultimate traffic noise level $L_{A10,18hr}$, in the year 2028 at the measurement location is 76.9 dB(A).

In order to best present the results of modelling the PEN 3D 2000 model will firstly be used to map the 60 dB(A) $L_{10,18hr}$ free field noise contour. This relates to the outdoor noise criteria from the *State Development Assessment Provisions – State Code 1 –Development in a State-controlled road environment.* It should be noted that the mapped contour levels are free field and do not include the +2.5 dB correction. Two contour maps have been produced the first one shows the whole development, while the second one focuses just on the affected section of the development adjacent to the Bruce Highway.

The noise contour maps produced by modelling are included in the next few pages of this report.


75.00
70.00
65.00
60.00
North
Contour Levels
80.0 to 85.0
75.0 to 80.0
70.0 to 75.0
65.0 to 70.0
60.0 to 65.0
Traffic Noise Levels 2028
Outdoor Free Field Levels L10 18 hr
PEN3D © ASK Software Engineers


75.00
70.00
65.00
60.00
North
Contour Levels
80.0 to 85.0
75.0 to 80.0
70.0 to 75.0
65.0 to 70.0
60.0 to 65.0
Traffic Noise Levels 2028
Outdoor Free Field Levels L10 18 hr
PEN3D © ASK Software Engineers

5.2 Rail Traffic Noise

5.2.1 Measured Train By Pass Levels

A logger was set to record train by pass levels at the rear of the site. The logger first recorded train noise levels over a 24 hour period. The total noise level for this period is recorded in the table below.

Descriptor	Time Period	Measured Level dB(A)
$L_{Aeq, 24hr}$	-	57

Table 4: Measured train noise levels at proposed site.

Individual train bypass noise levels were also recorded at the site. The Redcliffe Rail Line is used for regular electric passenger services and does not carry diesel freight trains. Maximum levels associated with fifteen loudest train bypasses are presented in the table below.

Noise Source	Time	Direction of Travel	Measured bypass Level dB(A) L_{Amax}
Electric Passenger Train	3.56 am	City	80.6
Electric Passenger Train	4.57 am	City	80.7
Electric Passenger Train	5.38 am	Redcliffe	82.2
Electric Passenger Train	6.20 am	City	79.2
Electric Passenger Train	6.32 am	City	80.0
Electric Passenger Train	6.38 am	Redcliffe	80.0
Electric Passenger Train	7.03 am	City	82.2
Electric Passenger Train	7.20 am	City	80.2
Electric Passenger Train	7.30 am	City	81.8
Electric Passenger Train	7.51 am	City	79.5
Electric Passenger Train	8.09 am	City	80.5
Electric Passenger Train	10.25 am	City	81.1
Electric Passenger Train	5.44 pm	Redcliffe	80.6
Electric Passenger Train	6.22 pm	Redcliffe	80.3
Electric Passenger Train	7.55 pm	Redcliffe	80.9
Single Event Maximum Sound Pressure Level			**81**

Table 5: Measured maximum noise levels from train bypass.

5.2.2 Modelled Train Noise Levels – Existing Situation

Rail noise predictions were conducted using PEN 3D 2000, a software model produced by Ask Software Engineers. To verify Rail noise prediction model, the L_{Amax} rail noise levels were calculated and compared to the measured noise levels for each track. The following assumptions were made in the verification of the noise model:

- Tracks are assumed to jointed and not continuously welded;
- The source line for electric passenger trains is assumed to be 0.5 m above track level (as Advised by QR);
- Source train L max levels are as supplied by Queensland rail and are included in the appendix to this report;
- The train speeds are assumed be 80 km/hr for all trains:

A print out of the calculations performed by the model is included in the appendix to this report. The results are compared to the measured value in the table below.

Train Type	Predicted* $L_{A,Max}$	Measured* $L_{A,Max}$
Diesel Train	80.9	81

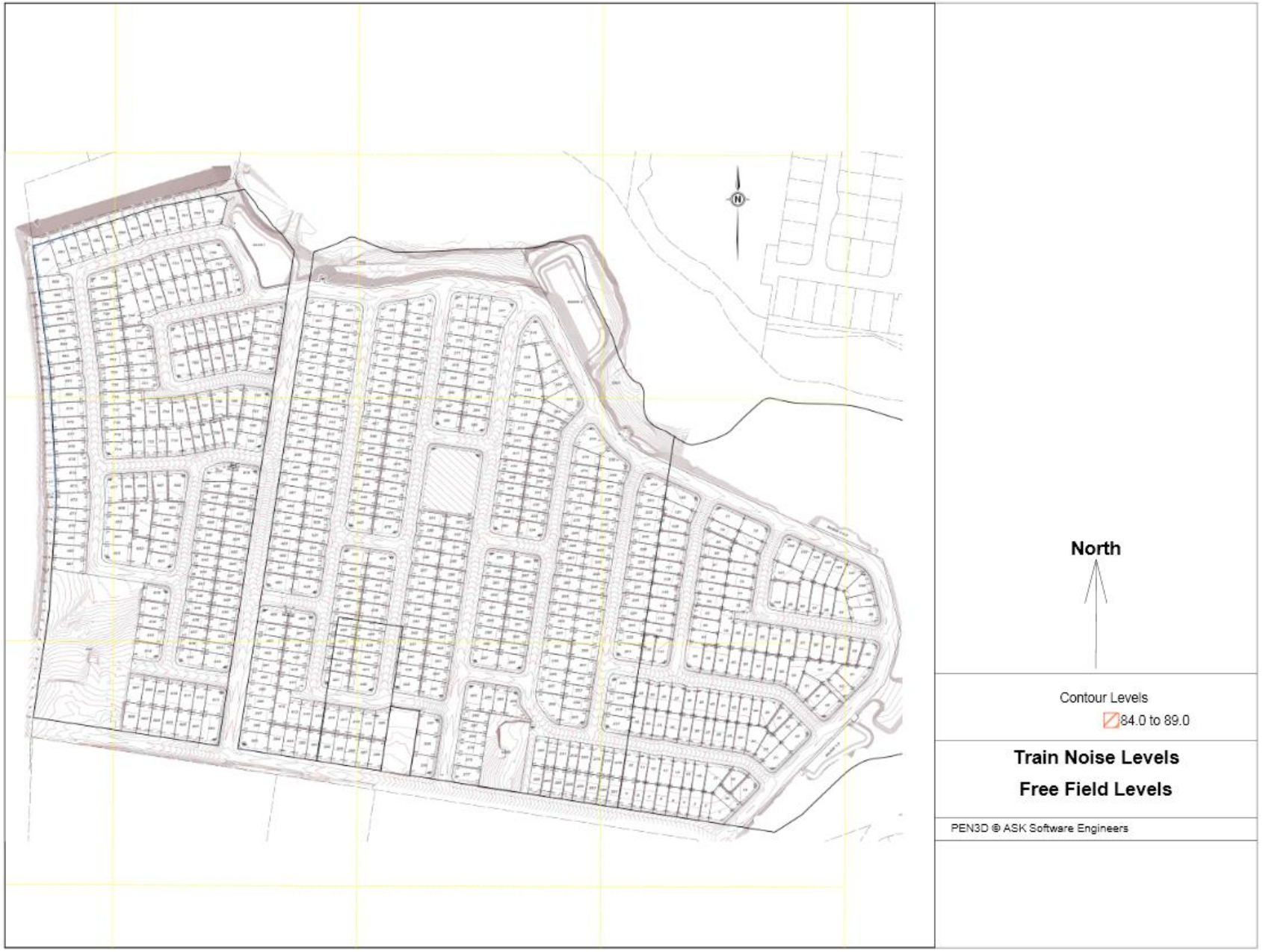
Table 6: A Comparison of Predicted and Measured Traffic Noise Levels at the Logger Location
*Levels Recorded in the Table are Free Field

From the table above it can be seen that all predictions by the software model are within +/- 2 dB(A) of the measured levels. This is an acceptable level accuracy allowing for the nature of field measurements.

5.2.2 Modelled Train Noise Levels

In order to best present the results of modelling the PEN 3D 2000 model will firstly be used to produce maps of the 84 dB(A) L_{amax} and 62 dB(A) $L_{aeq,\ 24\ hr}$ free field noise contours. These criteria relate to the outdoor noise criteria from the *State Development Assessment Provisions – State Code 2 –Development in a railway environment.* It should be noted that the mapped contour levels are free field and do not include the +2.5 dB correction.

The noise contour maps produced by modelling are included in the next few pages of this report.


N
North
Contour Levels
84.0 to 89.0
Train Noise Levels
Free Field Levels
PEN3D ® ASK Software Engineers

De

-


North
Contour Levels
62.0 to 67.0
Train Noise Levels
Free Field Levels - 24 hr Leq
PEN3D © ASK Software Engineers

6.0 RECOMMENDED ACOUSTIC TREATMENTS

6.1 Traffic Noise

Results of traffic noise modelling are contained in Section 5.1 of this report. The traffic noise contour maps have been produced showing the effect of traffic noise on the site. These traffic noise contour maps detail levels against the criteria for outdoor recreation space from *State Development Assessment Provisions – State Code 1 –Development in a State-controlled road environment.* Examining this mapping it can been seen that traffic noise levels over a large portion of the site will exceed the criteria level for outdoor recreation space from Code. In order to mitigate traffic noise levels it is proposed that a noise barrier be constructed along the western boundary of the site with the Bruce Highway and joined to the existing 4m high barrier that runs partially along the proposed Lot 902. Details of this barrier which has now been constructed on site is shown over the next three pages. Drawings GH2016/17/F1 Rev C, GH2016/17/F2 Rev C and GH2016/17/F1 Rev B produced by Greenhaven Projects, detail the height and location of the barrier. The red profile shows the "*as constructed*" heights of barrier.

The traffic noise contour maps produced in Section 5.1 have been remodeled allowing for the mitigation provided by the proposed barrier. It can been seen that following the inclusion of the noise barrier, outdoor traffic noise levels will be successfully mitigated to below the required outdoor criteria noise level from *State Development Assessment Provisions – Module 1 Community Amenity – 1.1 Managing noise and vibration impacts from transport corridors state code* on all lots other than a small portion of Lot 902. Given that Lot 902 is a large lot we believe that even though a portion of the lot will experience traffic noise levels above the criteria level there is more than sufficient outdoor recreation space at below the criteria level included in the lot.

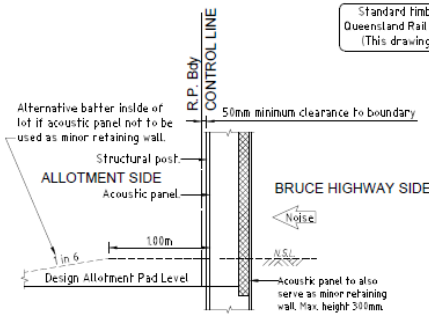
Following the noise contour maps detailing the traffic noise in the outdoor areas of the development two traffic noise contour maps related to *Noise Categories* from the *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code have been produced.. Contour mapping relating to the *Noise Categories* from the *MP 4.4* have been mapped at ground and upper storey level. In order to ensure required acoustic treatments to satisfy the appropriate *Noise Category* from the *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code are included in any future dwellings constructed on site it is recommended that the development be conditioned such that any new dwellings constructed on lots be constructed to include the appropriate acoustic building treatments to satisfy *Noise Categories* of the *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code. In Section 6.3 of this report recommend *Noise Categories* classification from *MP 4.4* based on traffic noise levels will be combined with the results for train noise modelling to classify the construction for future dwellings on each of the Lots within the proposed development.

DESIGN NOTES:

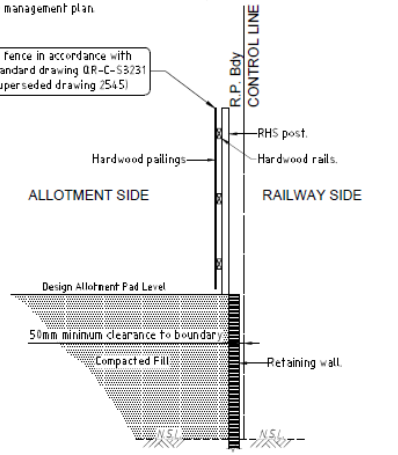
1. Acoustic fence adjacent to Bruce Highway road reserve must be designed and constructed in accordance with TMR Traffic Noise Management Code of Practice, Chapter 5 and Technical Standards MRS15 & MRTS 15.
2. Acoustic fence adjacent Moreton Bay Rail Link Property must be designed and constructed in accordance with "Queensland Rail Civil Engineering Technical Requirement CIVIL-SR-014 - Design of Noise Barriers" and must include anti-graffiti coating of the side of the barrier facing the railway.
3. RPEQ Certification that the works have been completed in accordance with both of the above requirements.
4. Adjoining the Moreton Bay Rail Link property where NO acoustic fence is to be constructed, fence must be constructed in accordance with Queensland Rail Std Dwg. QR-C-S3231 "Standard Timber Fence" and Section 11 - Anti Graffiti Coating of the Queensland Rail Civil Engineering Technical Requirements CIVIL-SR-005 "Design of Buildings Over or Near Railways" - In particular the fencing and any retaining walls associated with the acoustic fence or other fencing must be protected by a non-sacrificial and anti-graffiti coating on the side facing the railway.

CONSTRUCTION NOTES:

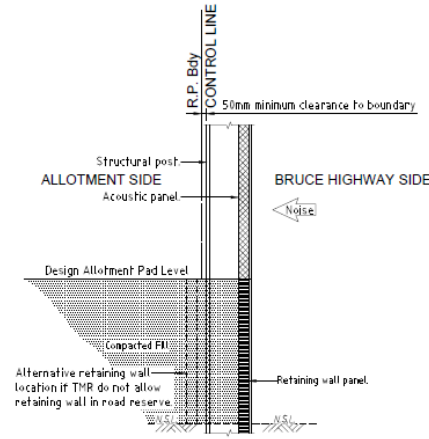
1. The design and construction of any excavation, filling/backfilling/compaction, retaining structures and other works involving ground disturbance must not de-stabilise the State controlled road or Moreton Bay Rail Link, including the rail transport infrastructure of the land supporting this infrastructure, or cause similar adverse impact.
2. RPEQ certification must be provided to the Development Assessment Team via NorthCoastIDAS@tmr.qld.gov.au (quote TMR15-013891), within the Department of Transport and Main Roads, that the works have been undertaken in accordance with note 1 above.
3. A construction management plan must be prepared by a suitably qualified and experienced RPEQ and given to the Development Assessment Team via NorthCoastIDAS@tmr.qld.gov.au (quote TMR15-013891) within the Department of Transport and Main Roads.
4. The construction management plan must demonstrate that there will be no disruption to the state controlled road during the course of construction.
5. The construction of the development must be in accordance with the construction management plan.



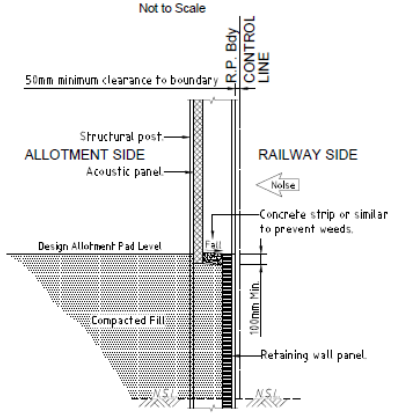
6m HIGH ACOUSTIC FENCE
TYPICAL SECTION BESIDE BRUCE HIGHWAY
ALLOTMENT IN CUT (CH.72 TO CH.207)
Not to Scale



1.85m HIGH RAILWAY FENCE TYPICAL SECTION
ALLOTMENT IN FILL (CH.530.220 TO CH.681.401)
Not to Scale



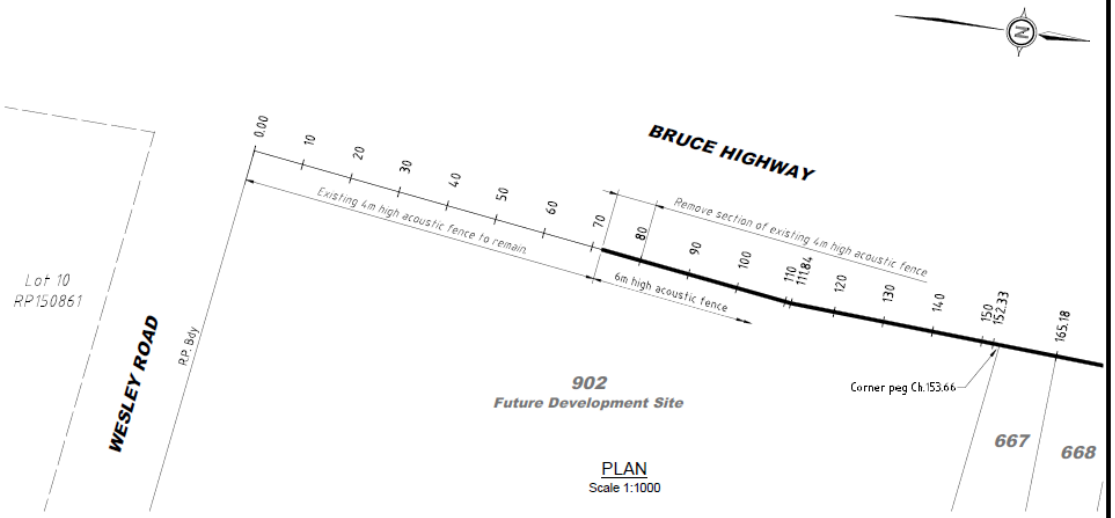
6m HIGH ACOUSTIC FENCE
TYPICAL SECTION BESIDE BRUCE HIGHWAY
ALLOTMENT IN FILL (CH.207 TO CH.485.819)
Not to Scale



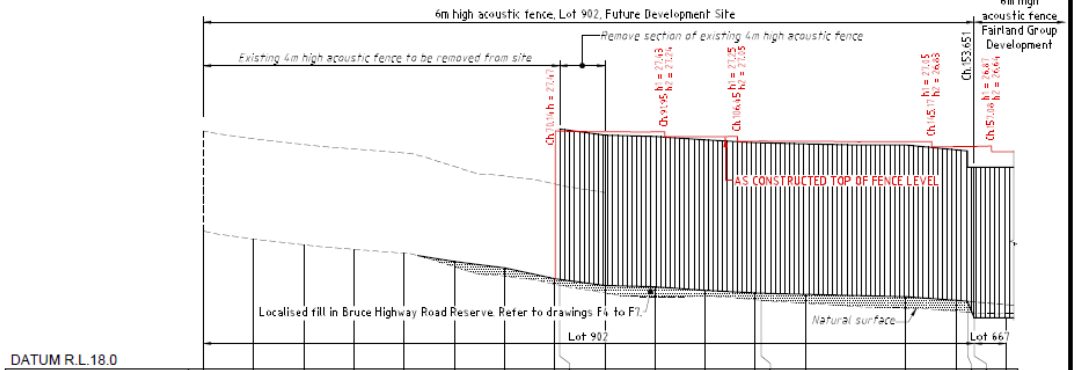
6m HIGH ACOUSTIC FENCE
TYPICAL SECTION BESIDE RAILWAY
ALLOTMENT IN FILL (CH.485.819 TO CH.530.220)
Not to Scale

FENCE TYPICAL SECTIONS

CONCRETE FOUNDATIONS NOT SHOWN FOR CLARITY



PLAN
Scale 1:1000



DATUM R.L.18.0

HEIGHT OF FENCE	4.00	4.00	4.00	4.00	4.00	4.00	4.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00		6.05	6.00	6.00	6.00	6.00			
TOP OF FENCE LEVEL	27.474	27.558	26.930	26.752	26.597	26.762	25.088	25.578	27.551	27.305	27.354	27.176	27.088	27.382	26.959		26.999	26.718	26.678	26.020	-0.635	-0.515	26.020
DESIGN ALLOTMENT HEIGHT TO FGL *																							
DESIGN ALLOTMENT PAD LEVEL ON CONTROL LINE																				26.020	26.020	26.020	26.020
FINISHED GROUND LEVEL ON CONTROL LINE (FGL)	28.474	28.558	22.932	22.752	22.597	22.058	22.088	21.578	21.551	21.305	21.354	21.176	21.088	20.382	20.959		20.859	20.718	20.678	20.655	26.655	26.545	26.020
CHAINAGE ON CONTROL LINE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	72.000	80.000	90.000	100.000	110.000	111.384	120.000		140.000	150.000	153.334	153.659	153.659	165.000	165.000

* Also equals height of allotment retaining wall.

AS CONSTRUCTED SURVEY DETAIL SUPPLIED BY LAND SURVEYING DYNAMICS

AS CONSTRUCTED DRAWING

L.Piggott RPEQ 3942
for Greenhaven Projects Pty. Ltd.
Date: 01/12/2019

LONGITUDINAL SECTION
Scale H 1:1000 V 1:200

HOR. 10 5 0 10 20 30 40m 1:1000-A3
VERT. 2 1 0 2 4 6 8m 1:200-A3
10 5 0 10 20 30 40 m
1:1000-A3

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MEMBER OF THE INSTITUTE OF MUNICIPAL ENGINEERING AUSTRALIA

AUTOCAD FILENAME: GH2016-17-F1 to F5.dwg - DATE: 3/12/19 XREFs:

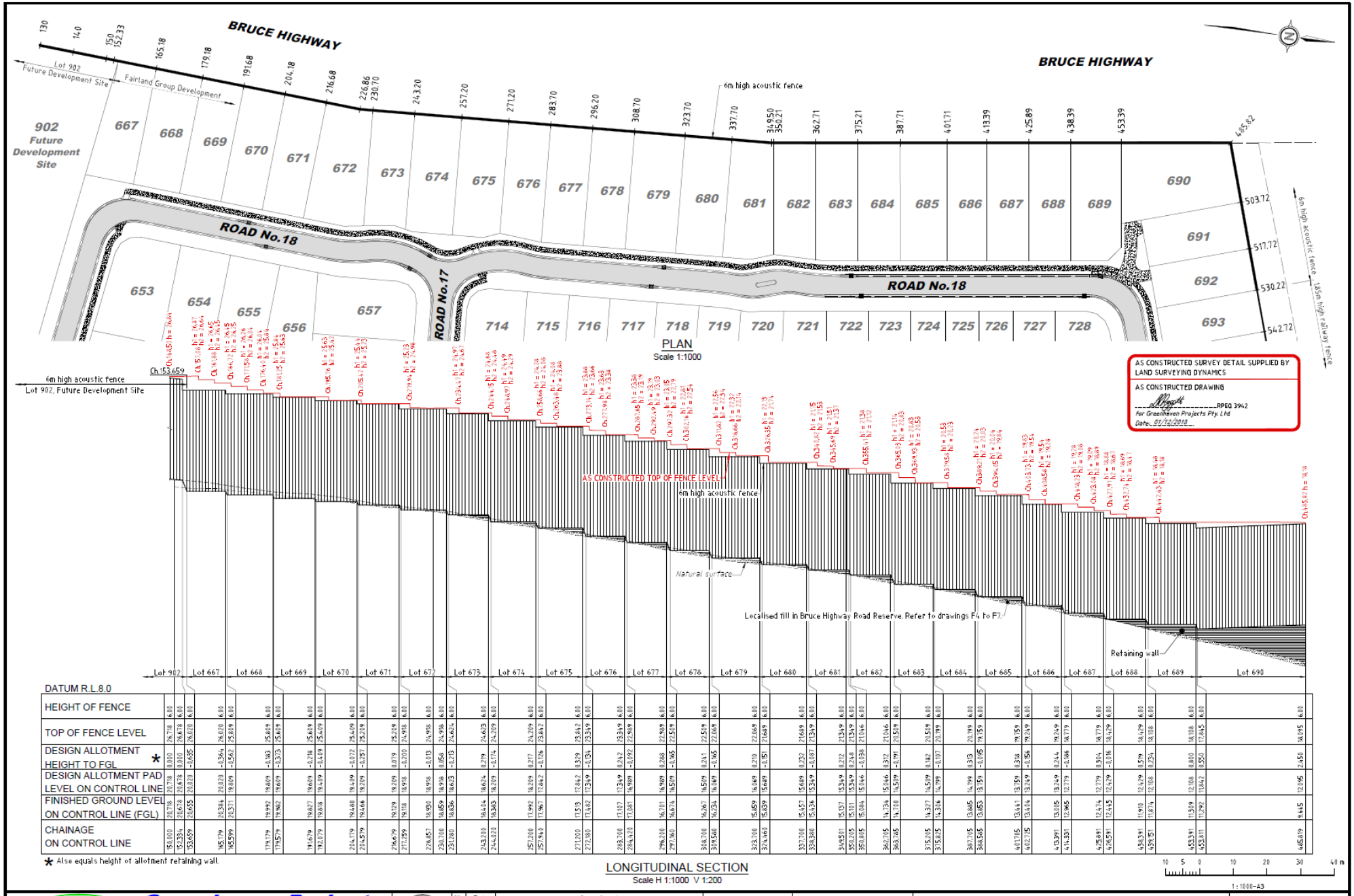
No	Date	Amendment
A	12/09/17	Existing 4m fence now to be removed and 6m fence installed.
B	21/09/17	Longsection updated to suit works in Bruce Hiway road reserve.
C	09/04/18	72m of existing fence to now remain. Typical cross sections updated.

Design: D.C.K.
Drawn: D.C.K.
Date: 31/05/2017
Checked: L.P.
Datum: A.H.D.

APPROVED
L.Piggott
LARRY PIGGOTT - RPEQ 3942
DATE: 09/04/2018
SIZE A3

CLIENT: FAIRLAND GROUP PTY. LTD.
PROJECT: PROPOSED BULK EARTHWORKS
AT: 66 WESLEY ROAD, GRIFFIN
LOT 1 ON SP273809
TITLE: ACOUSTIC FENCE PLAN & LONG SECTION - SHEET 1

COUNCIL REFERENCE: DA/30151/2015
DRAWING No: GH2016/17/F1 REV: C



Greenhaven Projects
consulting civil engineers • project management services
Pty. Ltd. ABN 68 067 110 169
P.O. Box 8200, Maroochydore D.C. QLD 4558
Phone (07) 5479 4220 Fax (07) 5479 4228

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AUTOCAD FILENAME: GH2016-17-F1 to F3.dwg – DATE: 3/12/18 – REFS:

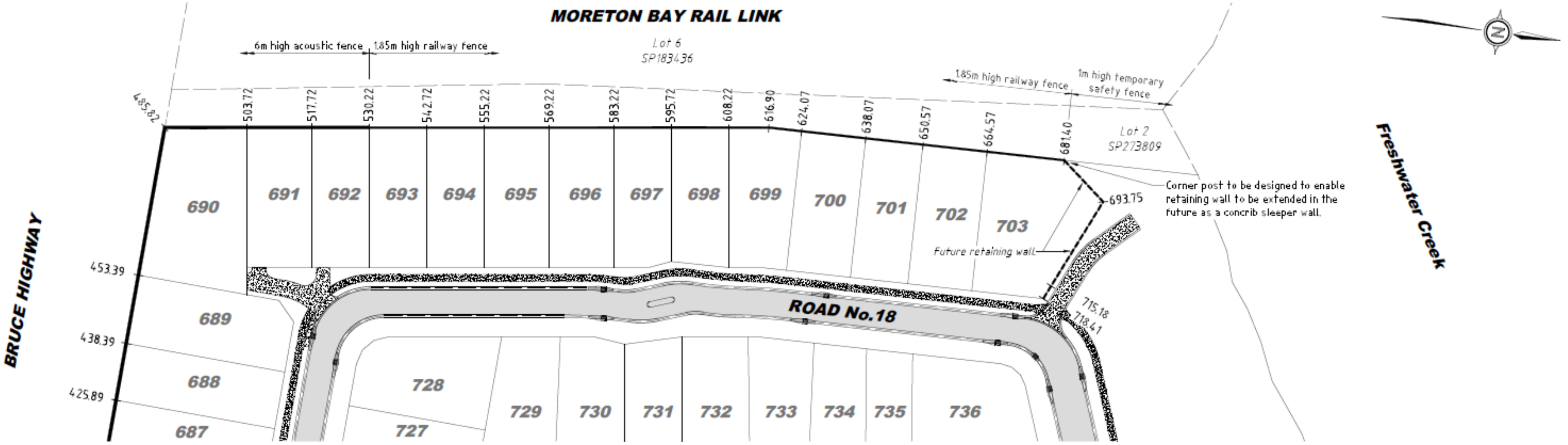
No	Date	Amendment
A	03/08/17	Height of railway fence amended from 2.0m to 1.85m.
B	12/09/17	Minor revisions.
C	21/09/17	Longsection updated to suit works in Bruce Hway road reserve.

Design: D.C.K.
Drawn: D.C.K.
Date: 31/05/2017
Checked: L.P.
Datum: A.H.D.

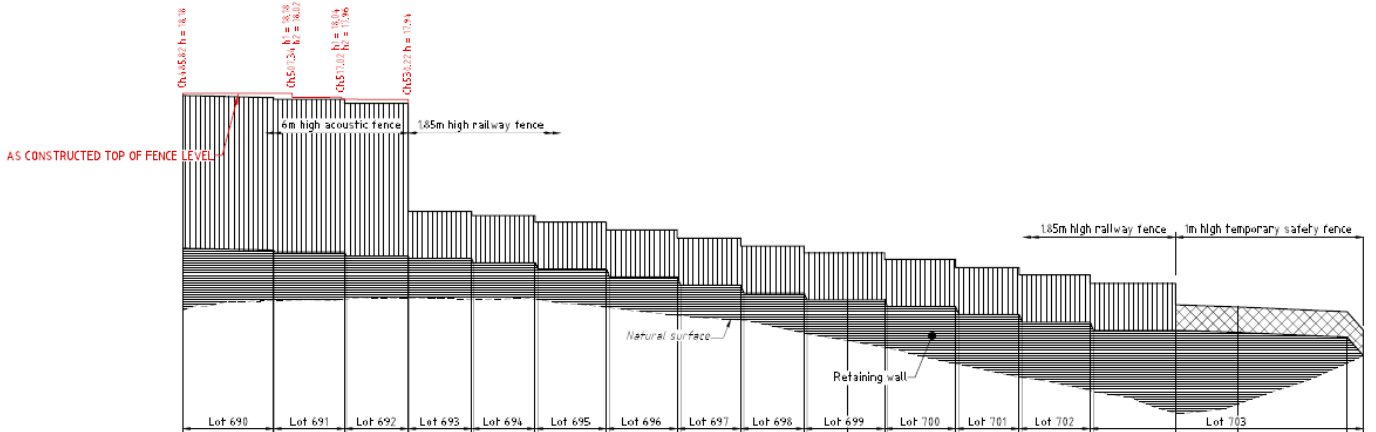
APPROVED
LARRY PIGGOTT - RPEQ 3942
DATE: 21/09/2017
SIZE A3

CLIENT: FAIRMONT GROUP PTY. LTD.
PROJECT: PROPOSED BULK EARTHWORKS
AT: 66 WESLEY ROAD, GRIFFIN
LOT 1 ON SP273809
TITLE: ACOUSTIC FENCE PLAN & LONG SECTION - SHEET 2

COUNCIL REFERENCE: DA/30151/2015
DRAWING No: GH2016/17/F2 REV: C



PLAN
Scale 1:1000



DATUM R.L.4.0

HEIGHT OF FENCE	6.00	6.00	6.00	6.00	6.00	6.00	1.85	1.85	1.85	1.85	1.85
TOP OF FENCE LEVEL	18.095	18.016	17.941	17.941	17.781	17.781	13.541	13.541	13.371	13.371	13.121
DESIGN ALLOTMENT HEIGHT TO FGL	2.450	1.986	1.910	1.853	1.687	1.662	1.573	1.600	1.430	1.435	1.204
DESIGN ALLOTMENT PAD LEVEL ON CONTROL LINE	12.095	12.016	11.941	11.941	11.781	11.781	11.691	11.691	11.521	11.521	11.271
FINISHED GROUND LEVEL ON CONTROL LINE (FGL)	9.645	10.030	10.031	10.088	10.094	10.119	10.118	10.091	10.091	10.086	10.067
CHAINAGE ON CONTROL LINE	485.819	503.720	503.880	517.720	518.040	530.220	530.400	542.720	543.060	555.220	555.820

HEIGHT OF FENCE	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
TOP OF FENCE LEVEL	13.121	12.811	12.811	12.491	12.491	12.181	12.181	11.911	11.911	11.911	11.651
DESIGN ALLOTMENT HEIGHT TO FGL	1.505	1.212	1.501	1.194	1.371	1.068	1.576	1.332	1.610	1.878	1.639
DESIGN ALLOTMENT PAD LEVEL ON CONTROL LINE	11.271	10.961	10.961	10.641	10.641	10.331	10.331	10.061	10.061	10.061	9.801
FINISHED GROUND LEVEL ON CONTROL LINE (FGL)	9.766	9.749	9.460	9.447	9.270	9.263	8.755	8.729	8.451	8.184	8.162
CHAINAGE ON CONTROL LINE	569.220	569.900	583.220	583.900	595.720	596.340	608.220	608.800	616.904	624.070	624.650

HEIGHT OF FENCE	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.00	1.00	1.00	1.00
TOP OF FENCE LEVEL	11.651	11.336	11.336	11.041	11.041	10.716	10.716	9.866	9.787	9.595	8.867
DESIGN ALLOTMENT HEIGHT TO FGL	2.241	1.955	2.458	2.181	2.697	2.401	3.256		3.187	1.018	0.000
DESIGN ALLOTMENT PAD LEVEL ON CONTROL LINE	9.801	9.486	9.486	9.191	9.191	8.866	8.866		8.787	8.595	7.867
FINISHED GROUND LEVEL ON CONTROL LINE (FGL)	7.560	7.531	7.029	7.010	6.494	6.465	5.610		5.600	7.577	7.867
CHAINAGE ON CONTROL LINE	638.070	638.730	650.570	651.170	664.570	665.250	681.401		693.746	715.179	718.408

★ Also equals height of allotment retaining wall.

LONGITUDINAL SECTION
Scale H 1:1000 V 1:200

AS CONSTRUCTED SURVEY DETAIL SUPPLIED BY LAND SURVEYING DYNAMICS

AS CONSTRUCTED DRAWING
____________________RPEQ 3942
for Greenhaven Projects Pty. Ltd.
Date 01/12/2018

10 5 0 10 20 30 40 m
1:1000-A3

Greenhaven Projects
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No	Date	Amendment
A	12/09/17	Minor revisions.
B	21/09/17	Longsection updated.

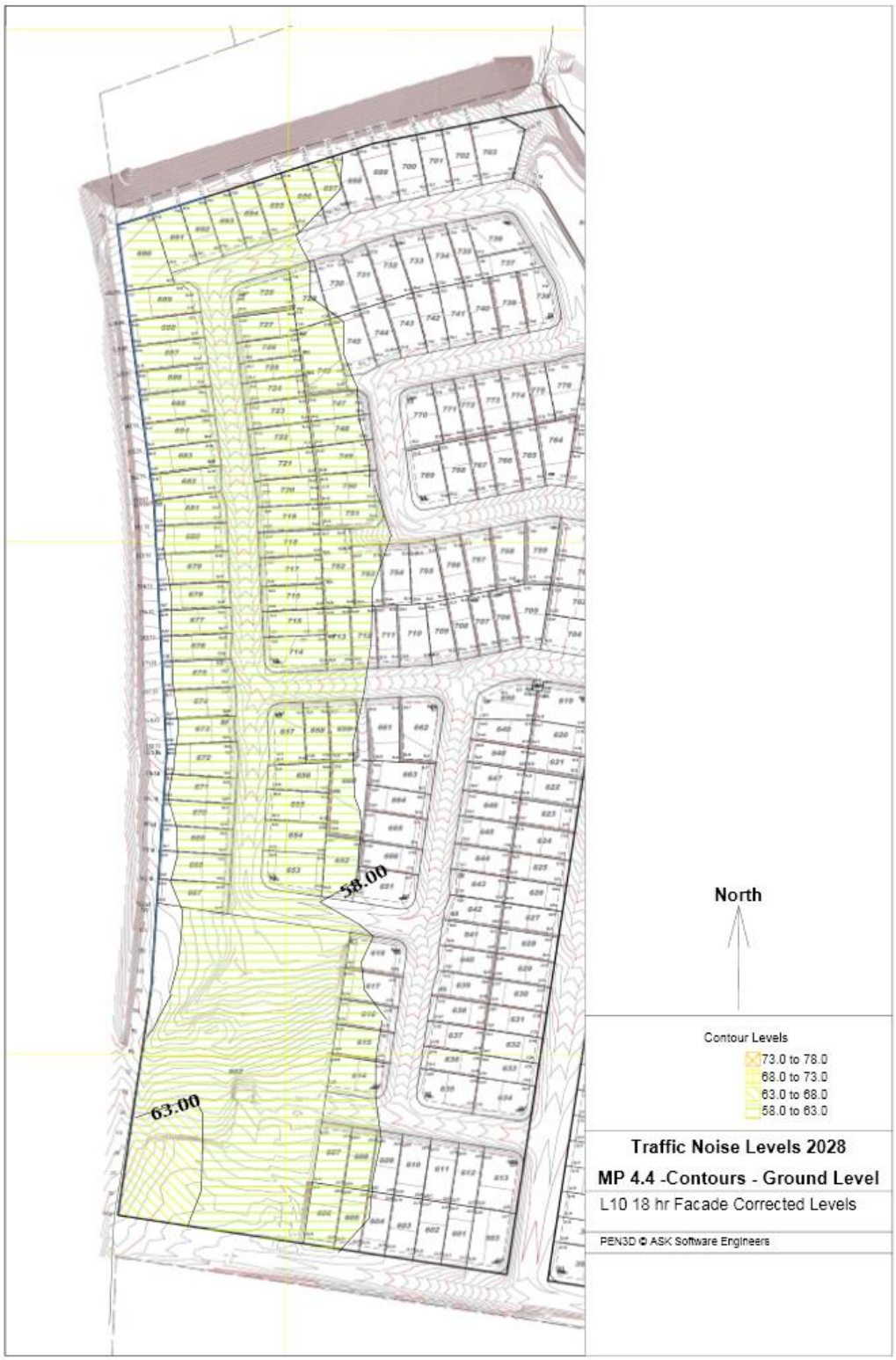
Design: D.G.K.
Drawn: D.G.K.
Date: 31/05/2017
Checked: L.P.
Datum: A.H.D.

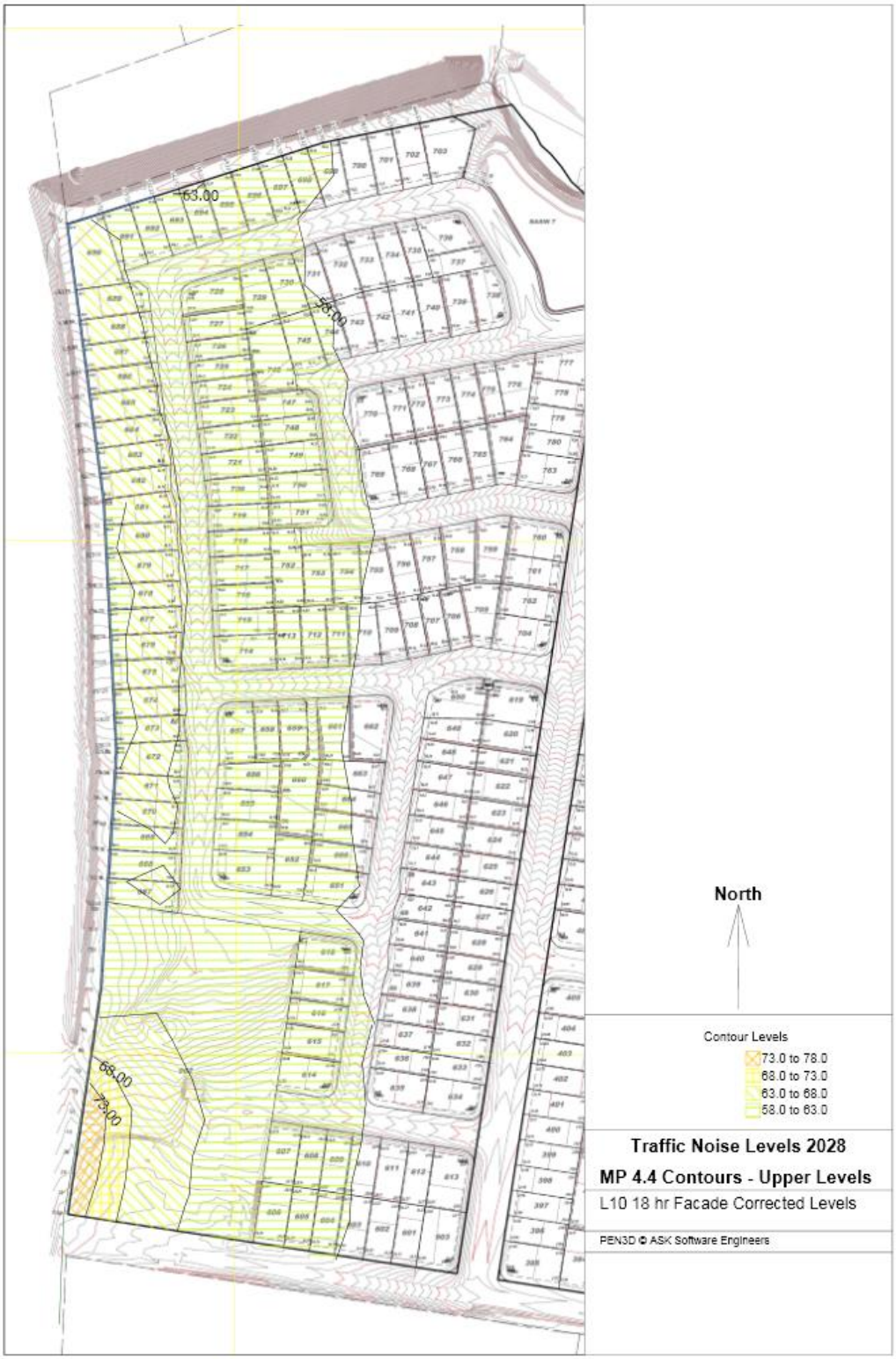
APPROVED
LARRY PIGGOTT - RPEQ 3942
DATE: 21/09/2017
SIZE A3

CLIENT: FAIRMONT GROUP PTY. LTD.
PROJECT: PROPOSED BULK EARTHWORKS
AT: 66 WESLEY ROAD, GRIFFIN
LOT 1 ON SP273809
TITLE: ACOUSTIC FENCE PLAN & LONG SECTION - SHEET 3

COUNCIL REFERENCE: DA/30151/2015
DRAWING No: GH2016/17/F3
REV: B


60.00
North
Contour Levels
80.0 to 85.0
75.0 to 80.0
70.0 to 75.0
65.0 to 70.0
60.0 to 65.0
Traffic Noise Levels 2028
Outdoor Traffic levels with Barrier
Free Field L10 18 hr Level
PEN3D © ASK Software Engineers

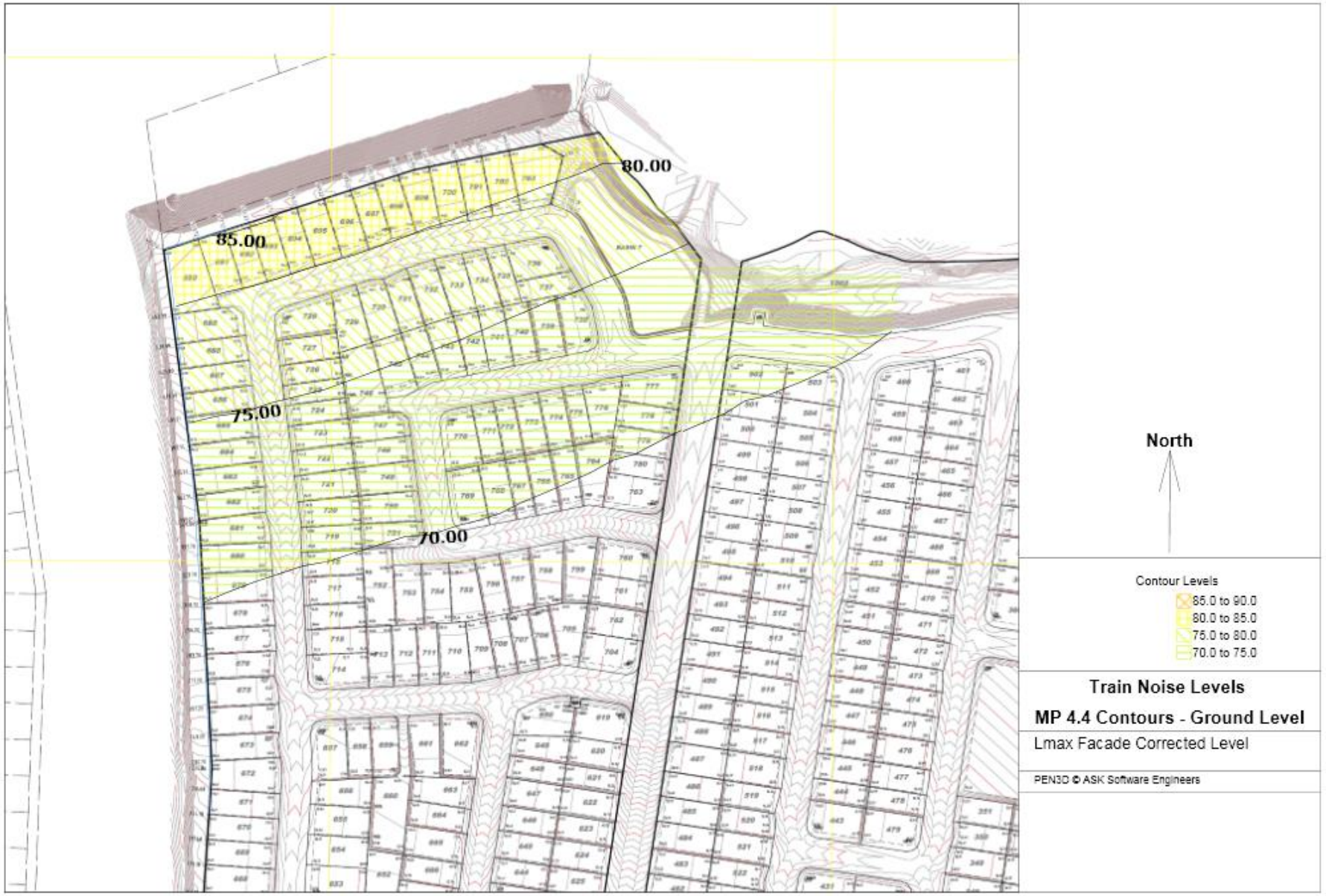

63.00
58.00
North
Contour Levels
73.0 to 78.0
68.0 to 73.0
63.0 to 68.0
58.0 to 63.0
Traffic Noise Levels 2028
MP 4.4 -Contours - Ground Level
L10 18 hr Facade Corrected Levels
PEN3D © ASK Software Engineers


63.00
58.00
68.00
73.00
North
Contour Levels
73.0 to 78.0
68.0 to 73.0
63.0 to 68.0
58.0 to 63.0
Traffic Noise Levels 2028
MP 4.4 Contours - Upper Levels
L10 18 hr Facade Corrected Levels
PEN3D © ASK Software Engineers

6.2 Train Noise

Results of train noise modelling are contained in Section 5.2 of this report. Train noise contour maps produced in this section relate to the criteria for outdoor recreation space for train noise from *State Development Assessment Provisions – State Code 2 –Development in a railway environment.* Examining this mapping it can been seen that train noise levels **do not** exceed the criteria level for outdoor recreation space from *State Development Assessment Provisions – State Code 2 –Development in a railway environment.* Hence no measures are required to mitigate train noise impacts in the outdoor recreation areas of the development.

In Section 6.1 a noise barrier was proposed to mitigate traffic noise levels at the site. This barrier will be slightly return along the northern boundary of the site. Although the barrier is solely proposed to mitigate traffic noise levels at the site it will also act to reduce train noise levels at the site. The two train noise contour maps relating to the *Noise Categories* from the *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code on the following two pages. These train noise contour maps also take into account the effect of the traffic noise barrier. Contour mapping relating to the *Noise Categories* from the *MP 4.4* have been mapped at ground and upper storey level. In order to ensure required acoustic treatments to satisfy the appropriate *Noise Category* from the *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code are included in any future dwellings constructed on site it is recommended that the development be conditioned such that any new dwellings constructed on lots be constructed to include the appropriate acoustic building treatments to satisfy *Noise Categories* of the *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code. In Section 6.3 of this report the recommended *Noise Categories* classification from *MP 4.4* based on traffic noise levels will be combined with the results for train noise modelling to classify the construction for future dwellings on each of the Lots within the proposed development.


80.00
85.00
75.00
70.00
North
Contour Levels
85.0 to 90.0
80.0 to 85.0
75.0 to 80.0
70.0 to 75.0
Train Noise Levels
MP 4.4 Contours - Ground Level
Lmax Facade Corrected Level
PEN3D © ASK Software Engineers


80.00
85.00
75.00
70.00
North
Contour Levels
85.0 to 90.0
80.0 to 85.0
75.0 to 80.0
70.0 to 75.0
Train Noise Levels
MP 4.4 Contours - Upper Level
Lmax Facade Corrected Level
PEN3D © ASK Software Engineers

6.3 Noise Categories MP 4.4 – *Building in a Transport Noise Corridor*

Using the noise contour mapping produced in Sections 6.1 and 6.2 relating to traffic and train noise classification against the *Noise Categories* from the *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code the classification for the construction of future dwelling on the site has been determined at ground and upper storey level. These classifications are detailed in Table 4 over the page. It is recommended that the approval of the development be conditioned such that future dwelling constructed on the site are constructed to meet the appropriate classification in relation to the *Noise Categories* from the *MP 4.4 – Building in a Transport Noise Corridor* determined in this table.

Lot No.	Noise Category QDC MP 4.4 Level	
	Ground Level	Upper Level
1 to 122 (Inclusive)	0	0
201 to 500 (Inclusive)	0	0
501	1	1
502	1	1
503	1	1
504 to 525	0	0

Table 4: Classification of Building Construction in Relation to the Noise Categories From MP 4.4

Lot No.	Noise Category QDC MP 4.4 Level	
	Ground Level	Upper Level
601	0	0
602	0	0
603	0	1
604	1	1
605	1	1
606	1	1
607	1	1
608	1	1
609	1	1
610	0	1
611	0	1
612	0	0
613	0	0
614	1	1
615	1	1
616	1	1
617	1	1
618	1	1
619	0	0
620	0	0
621	0	0
622	0	0
623	0	0
624	0	0
625	0	0
626	0	0
627	0	0
628	0	0
629	0	0
630	0	0
631	0	0
632	0	0

Table 4 continued: Classification of Building Construction in Relation to the Noise Categories From MP 4.4

Lot No.	Noise Category QDC MP 4.4 Level	
	Ground Level	Upper Level
633	0	0
634	0	0
635	0	1
636	0	1
637	0	1
638	0	1
639	0	1
640	0	1
641	0	1
642	0	1
643	0	0
644	0	0
645	0	0
646	0	0
647	0	0
648	0	0
649	0	0
650	0	0
651	0	1
652	1	1
653	1	1
654	1	1
655	1	1
656	1	1
657	1	1
658	1	1
659	1	1
660	1	1
661	1	1
662	0	1
663	1	1
664	1	1

Table 4 continued: Classification of Building Construction in Relation to the Noise Categories from MP 4.4

Lot No.	Noise Category QDC MP 4.4 Level	
	Ground Level	Upper Level
665	0	1
666	0	1
667	1	2
668	1	2
669	1	2
670	1	2
671	1	2
672	1	2
673	1	2
674	1	2
675	1	2
676	1	2
677	1	2
678	1	2
679	1	2
680	1	2
681	1	2
682	1	2
683	1	2
684	1	2
685	1	2
686	2	2
687	2	2
688	2	2
689	2	2
690	3	3
691	3	3
692	3	3
693	3	3
694	3	3

Table 4 continued: Classification of Building Construction in Relation to the Noise Categories from MP 4.4

Lot No.	Noise Category QDC MP 4.4 Level	
	Ground Level	Upper Level
695	3	3
696	3	3
697	3	3
698	3	3
699	3	3
700	3	3
701	3	3
702	3	3
703	3	3
704	0	0
705	0	0
706	0	0
707	0	0
708	0	0
709	0	1
710	1	1
711	1	1
712	1	1
713	1	1
714	1	1
715	1	1
716	1	1
717	1	1
718	1	1
719	1	1
720	1	1
721	1	1
722	1	1
723	1	1
724	1	1

Table 4 continued: Classification of Building Construction in Relation to the Noise Categories from MP 4.4

Lot No.	Noise Category QDC MP 4.4 Level	
	Ground Level	Upper Level
725	2	2
726	2	2
727	2	2
728	2	2
729	2	2
730	2	2
731	2	2
732	2	2
733	2	2
734	2	2
735	2	2
736	2	2
737	2	2
738	1	2
739	1	2
740	1	2
741	1	2
742	1	2
743	1	2
744	1	2
745	1	2
746	1	2
747	1	1
748	1	1
749	1	1
750	1	1
751	1	1
752	1	1
753	1	1
754	1	1

Table 4 continued: Classification of Building Construction in Relation to the Noise Categories from MP 4.4

Lot No.	Noise Category QDC MP 4.4 Level	
	Ground Level	Upper Level
755	1	1
756	0	1
757	0	0
758	0	0
759	0	0
760	0	0
761	0	0
762	0	0
763	0	0
764	1	1
765	1	1
766	1	1
767	1	1
768	1	1
769	1	1
770	1	1
771	1	1
772	1	1
773	1	1
774	1	1
775	1	1
776	1	1
777	1	1
778	1	1
779	1	1
780	0	0
902	2	3
903	0	0

Table 4 continued: Classification of Building Construction in Relation to the Noise Categories from MP 4.4

7.0 DISCUSSION & CONCLUSIONS

As the proposed development is located adjacent to the Bruce Highway an assessment of traffic noise impacts on the site against the criteria levels from the *State Development Assessment Provisions – State Code 1 –Development in a State-controlled road environment* and *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code was undertaken in this report. Traffic noise levels in outdoor areas of the development were firstly assessed against the criteria levels for outdoor areas contained in the *State Development Assessment Provisions – State Code 1 –Development in a State-controlled road environment.* This assessment determined that the traffic noise levels in outdoor areas over a large portion of the site would exceed the criteria levels. In order to mitigate traffic noise in the outdoor areas of the site an acoustic barrier has been constructed along the boundary of the site with the Bruce Highway and joined to the existing 4m high barrier that runs partially along the proposed Lot 902 and then returned along the northern boundaries of Lots 690, 691 and 692. Details of this barrier which has now been constructed on site is shown on Drawings GH2016/17/F1 Rev C, GH2016/17/F2 Rev C and GH2016/17/F1 Rev B produced by Greenhaven Projects, included Section 6.1 of this report. The red profile shows the "*as constructed*" heights of barrier. Further modelling conducted in this report determined this barrier would successfully mitigate traffic noise in outdoor areas throughout the site.

The Moreton Bay Rail Link has been constructed along the Northern boundary of the development. Train noise impacts from the line were considered in this report. Rail noise impacts on the site were assessed against the criteria levels from the *State Development Assessment Provisions – State Code 2 –Development in a railway environment.* Modelling conducted of future rail noise impacts determined that rail noise impacts would not exceed the criteria for outdoor recreation space from *State Development Assessment Provisions – State Code 2 –Development in a railway environment.* Hence no barriers or other acoustic treatments have been recommended to mitigate rail noise impacts in these areas.

Rail and Traffic noise impacts were also modelled against the *Noise Category* levels from *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code. This modelling was presented in Sections 6.1 and 6.2 of the report in the form of noise contour mapping. Based on these noise contour maps, the future construction of dwellings on each of the lot, at both ground and upper level were classified into one of the *Noise Category* levels from *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code. It is recommended that the approval of the development be conditioned such that the constructions of future dwellings on each of the Lots achieve the requirements of the relevant *Noise Category* levels from *MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code into which the Lot has been classified.

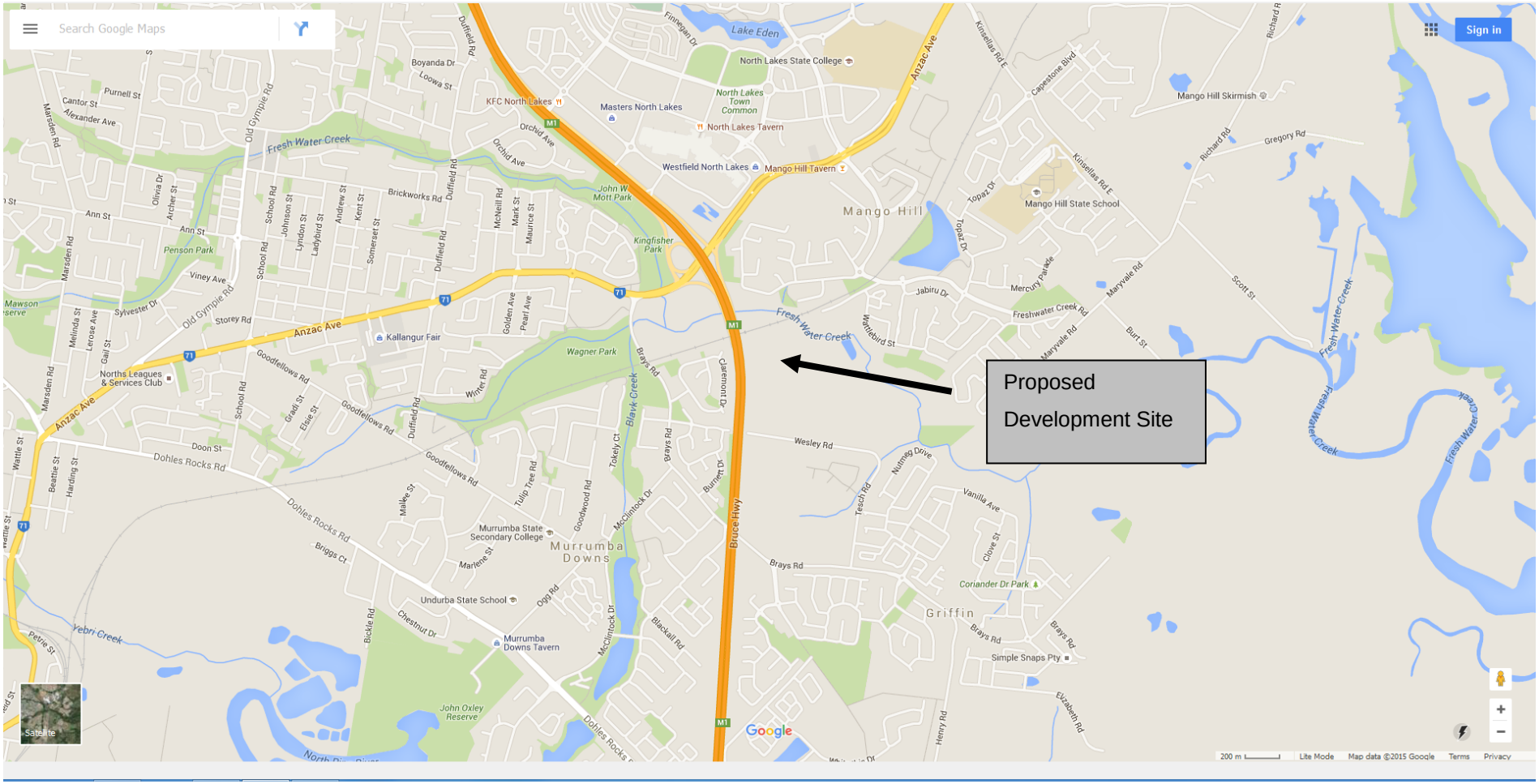
Subject to our calculations, the inclusion of the proposed Noise barrier detailed in Drawings GH2016/17/F1 Rev C, GH2016/17/F2 Rev C and GH2016/17/F1 Rev B produced by Greenhaven Projects and conditions relating to construction of future dwellings on the site, Decibell Consulting believe that development will comply with the requirements of the *State Development Assessment Provisions – State Code 1 – Development in a State-controlled road environment, State Development Assessment Provisions – State Code 2 –Development in a railway environment, MP 4.4 – Building in a Transport Noise Corridor* from the Queensland Development Code and the Moreton Bay Regional Planning Scheme and should be approved.

Report Compiled by:

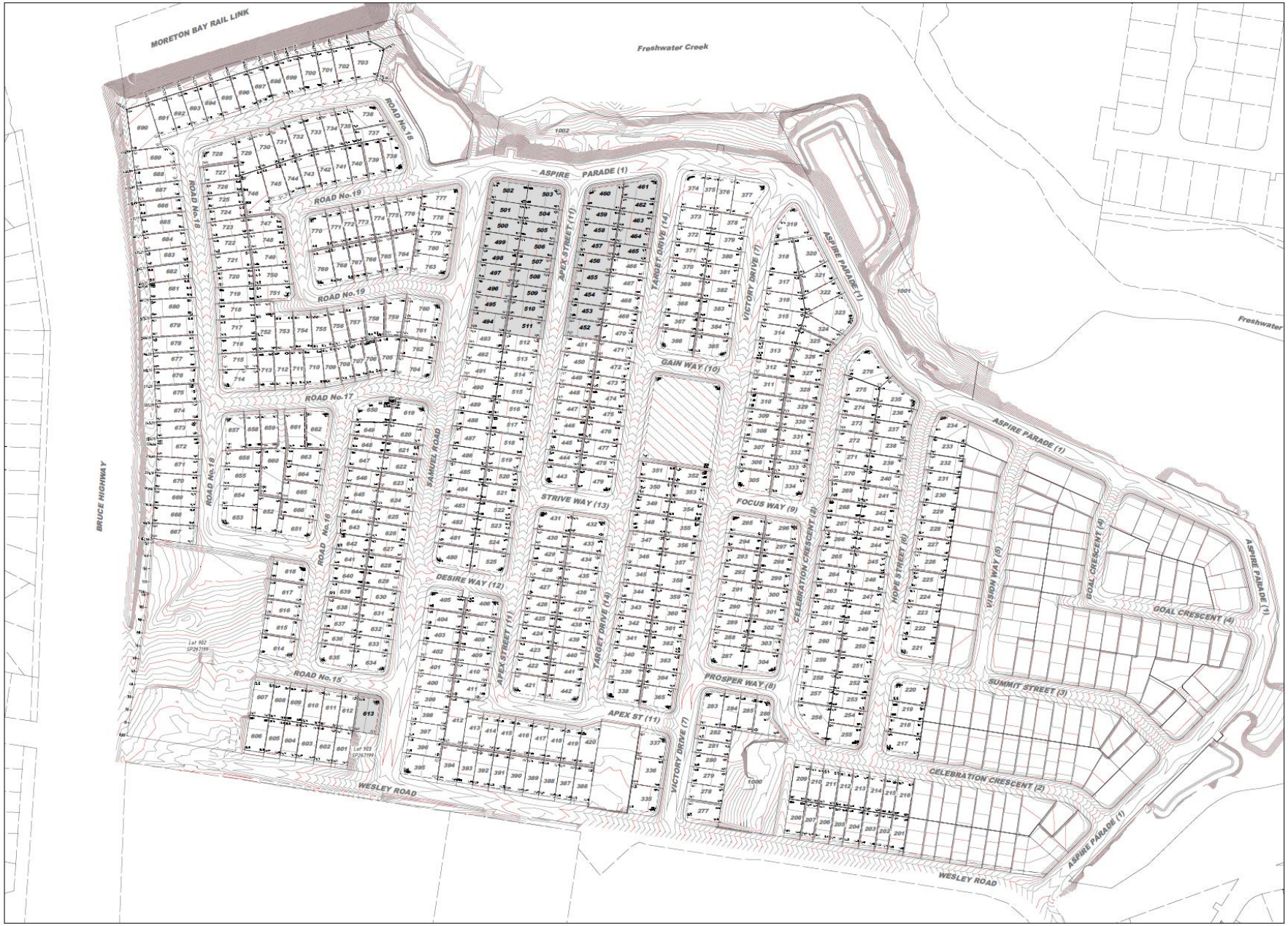
John Cristaudo BE
Decibell Consulting

APPENDIX

Sketch No.1 -Location of Proposed Development Site



Sketch No.2 –Aerial Photograph of the Proposed Development Site

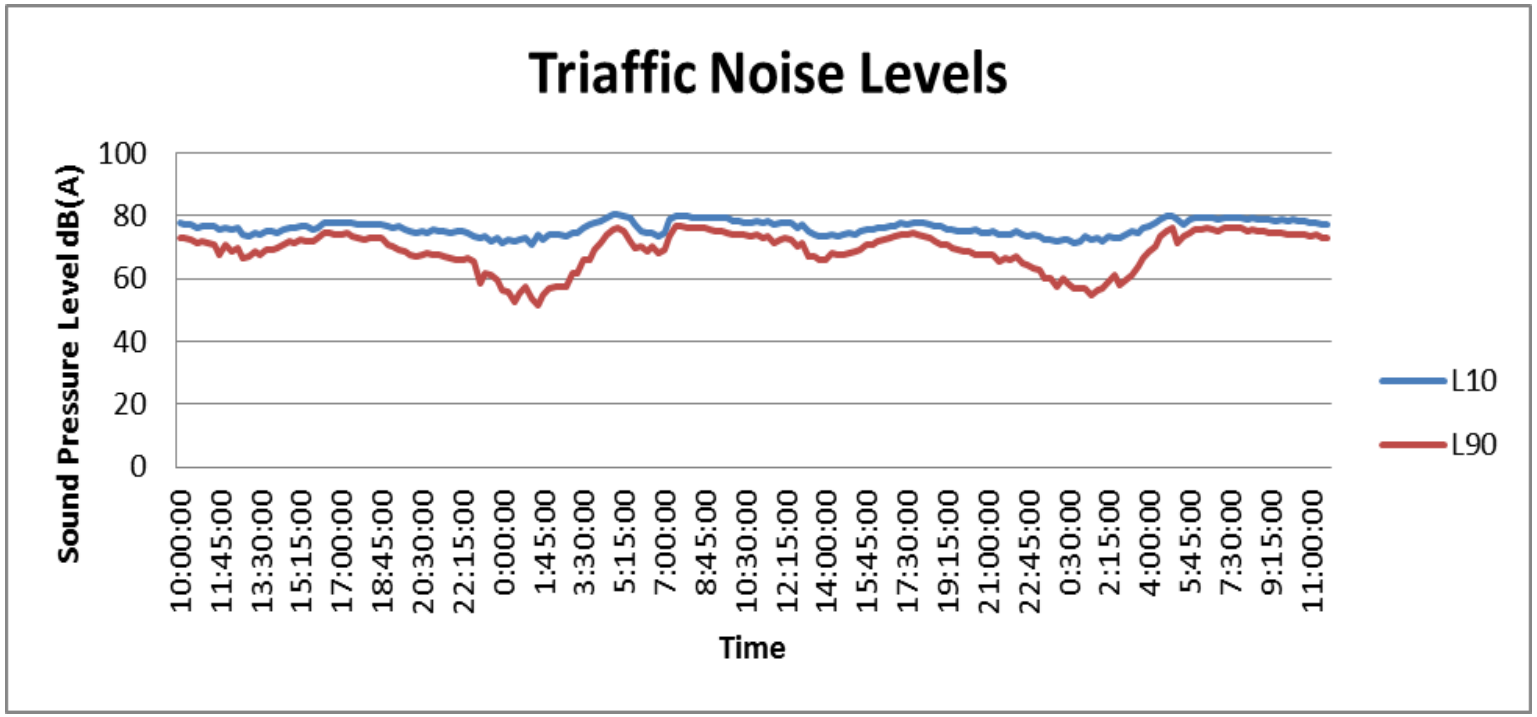

MORETON BAY RAIL LINK
Freshwater Creek
ROAD No.18
ROAD No.19
ROAD No.17
ROAD No.16
ROAD No.15
ASPIRE PARADE (1)
APEX STREET (11)
TARGET DRIVE (14)
VICTORY DRIVE (7)
GAIN WAY (10)
STRIVE WAY (13)
FOCUS WAY (9)
DESIRE WAY (12)
PROSPER WAY (8)
APEX ST (11)
SAMUEL ROAD
CELEBRATION CRESCENT (2)
HOPE STREET (6)
VISION WAY (5)
GOAL CRESCENT (4)
SUMMIT STREET (3)
BRUCE HIGHWAY
WESLEY ROAD
Freshwater

Schedule 1

Noise category	Minimum *transport noise reduction* (*dB (A)*) required for *habitable rooms*	Component of building's *external envelope*	Minimum R_w required for each component
Category 4	40	Glazing	43
		External walls	52
		Roof	45
		Floors	51
		Entry doors	35
Category 3	35	Glazing	38 (where total area of glazing for a *habitable room* is greater than 1.8m^2)
			35 (where total area of glazing for a *habitable room* is less than or equal to 1.8m^2)
		External walls	47
		Roof	41
		Floors	45
		Entry doors	33

Noise category	**Minimum *transport noise reduction* (*dB (A)*) required for *habitable rooms***	**Component of building's *external envelope***	**Minimum R_w required for each component**
Category 2	30	Glazing	35 (where total area of glazing for a *habitable room* is greater than 1.8m^2)
			32 (where total area of glazing for a *habitable room* is less than or equal to 1.8m^2)
		External walls	41
		Roof	38
		Floors	45
		Entry doors	33
Category 1	25	Glazing	27 (where total area of glazing for a *habitable room* is greater than 1.8m^2)
			24 (where total area of glazing for a *habitable room* is less than or equal to 1.8m^2)
		External walls	35
		Roof	35
		Entry Doors	28
Category 0	No additional acoustic treatment required – standard building assessment provisions apply.		

TRAFFIC NOISE MODELLING


Triaffic Noise Levels
Sound Pressure Level dB(A)
100
80
60
40
20
0
10:00:00
11:45:00
13:30:00
15:15:00
17:00:00
18:45:00
20:30:00
22:15:00
0:00:00
1:45:00
3:30:00
5:15:00
7:00:00
8:45:00
10:30:00
12:15:00
14:00:00
15:45:00
17:30:00
19:15:00
21:00:00
22:45:00
0:30:00
2:15:00
4:00:00
5:45:00
7:30:00
9:15:00
11:00:00
Time
L10
L90

POINT CALCULATIONS

Pen3D2000 V1.9.8
Project Code:Pen
Project Description:PEN noise model
File:C:\dB consulting\Noise Jobs\66 Wesley Rd Griffin\66 Wesley Rd Griffin traffic.PEN
File Description: Logger 2015

Tuesday 06 Oct, 2015 at 17:06:14

CoRTN Calculations

All road segments included. Segmentation angle: 10degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))
logger	177.4	593.6	1.5	74.9

POINT CALCULATIONS

Pen3D2000 V1.9.8
Project :Pen Demo
Project Description: PEN noise model
File:C:\dB consulting\Noise Jobs\66 Wesley Rd Griffin\66 Wesley Rd Griffin traffic.PEN
File Description: Logger 2028

Monday 17 Dec, 2018 at 16:15:17

CoRTN Calculations

All road segments included. Segmentation angle: 10degrees. Road elevations apply.

Receptor	X Posn (m)	Y Posn (m)	Height (m)	L10(18hour) (dB(A))
logger	183.3	485.4	1.5	76.9

TRAIN NOISE MODELLING

POINT CALCULATIONS

Pen3D2000 V1.9.8
Project Code:Pen
Project Description: PEN noise model
File:C:\dB consulting\Noise Jobs\66 Wesley Rd Griffin\66 Wesley Rd Griffin.PEN
File Description: Logger

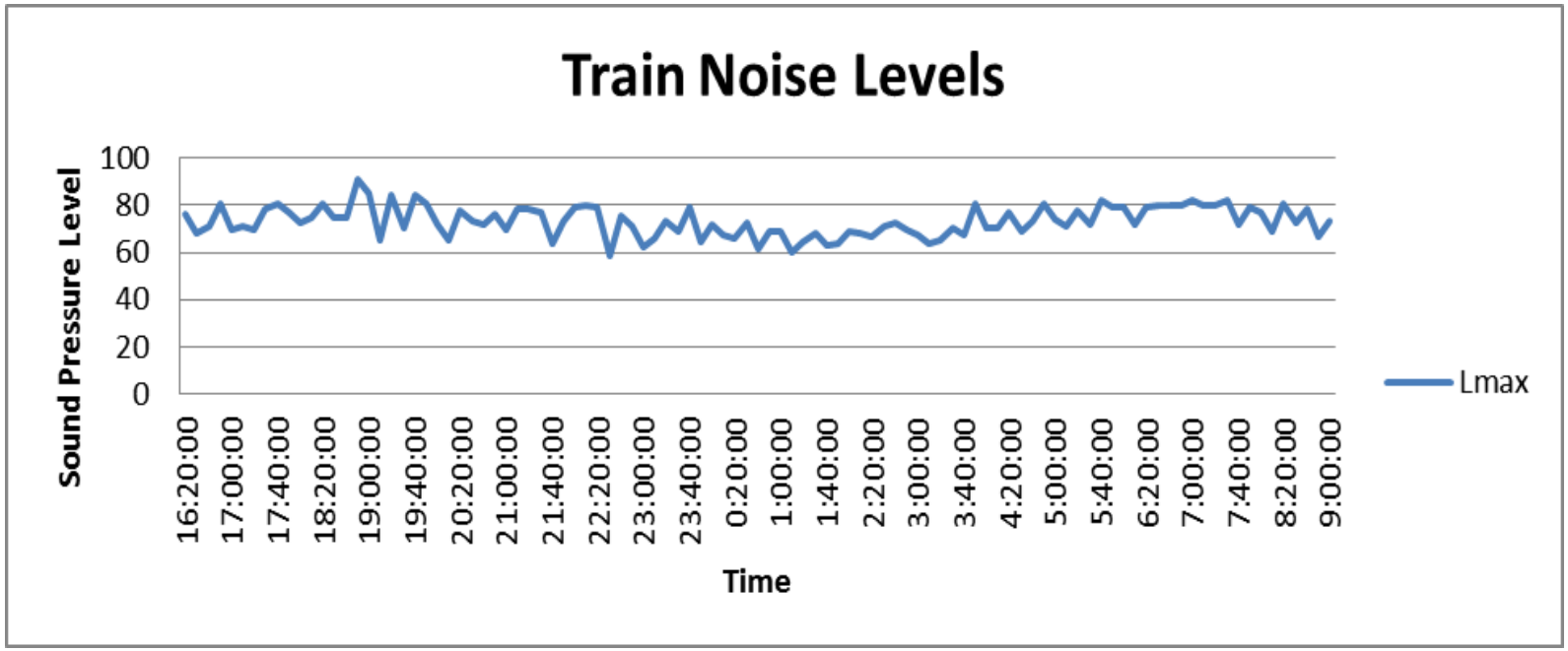
Monday 24 Jul, 2017 at 11:57:18

Environmental Calculations (Railway - Moving Line Source)

All railway (moving line) sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.
Noise level results include the maximum of all the noise sources
Meteorology :

Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m)
Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%)
Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)

Receptor	X Posn (m)	Y Posn (m)	Height (m)	Ground (m)		Noise Level (dB(A))
logger	341.4	705.2	1.5		80.9	


Train Noise Levels
Sound Pressure Level
100
80
60
40
20
0
16:20:00
17:00:00
17:40:00
18:20:00
19:00:00
19:40:00
20:20:00
21:00:00
21:40:00
22:20:00
23:00:00
23:40:00
0:20:00
1:00:00
1:40:00
2:20:00
3:00:00
3:40:00
4:20:00
5:00:00
5:40:00
6:20:00
7:00:00
7:40:00
8:20:00
9:00:00
Time
Lmax